

O. A. COLBY.
CONTROL APPARATUS.
APPLICATION FILED DEC. 2, 1915.

1,361,966.

Patented Dec. 14, 1920.

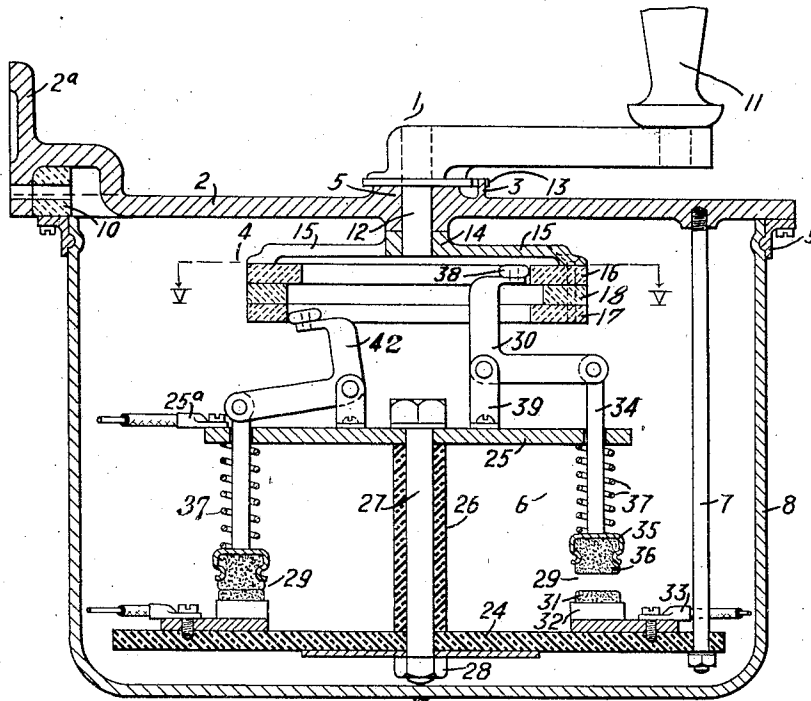


Fig. 1.

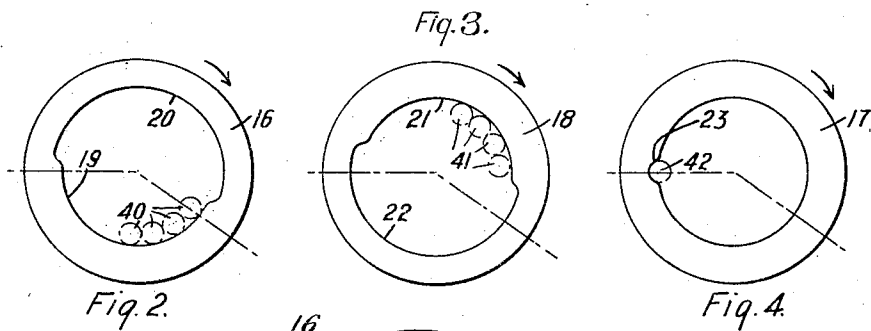


Fig. 2.

Fig. 3.

Fig. 4.

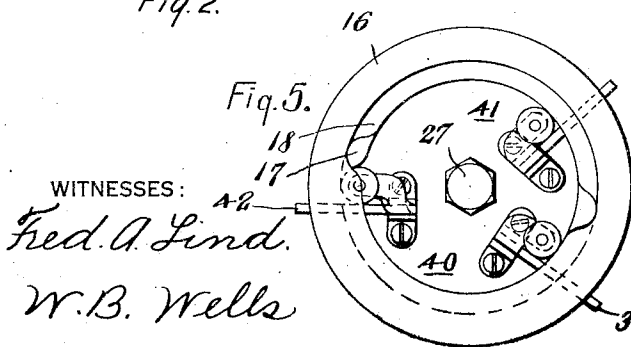


Fig. 5.

WITNESSES:

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CONTROL APPARATUS.

1,361,966.

Specification of Letters Patent.

Patented Dec. 14, 1920.

Application filed December 2, 1915. Serial No. 64,675.

To all whom it may concern:

Be it known that I, ORA A. COLBY, a citizen of the United States, and a resident of Larimer, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Control Apparatus, of which the following is a specification.

My invention relates to controllers for electrical circuits and particularly to controllers which operate a plurality of switches in a predetermined order.

One object of my invention is to provide a controller that shall be simple in construction and reliable in operation and that shall directly and mechanically operate a plurality of switches in any desired order.

Another object of my invention is to provide a controller of the above indicated class that shall close one switch in the off-position thereof and a number of switches in sequence in case the controller is moved in a forward direction.

A further object of my invention is to provide a controller that shall be provided with switches to be spring-closed and to be opened by manually operated cams.

In the accompanying drawings illustrating my invention, Figure 1 is a sectional view of a controller constructed in accordance with my invention, the section being taken along the dot-and-dash lines of Figs. 2, 3 and 4; Figs. 2, 3 and 4 are detail views of the upper, middle and lower annular cams, respectively, and Fig. 5 is a sectional plan view of a portion of the structure shown in Fig. 1, taken along the line V—V.

Referring to the drawing, a master controller 1 is shown as embodying a top 2 which is preferably made of cast iron and has a projecting lug 3 for a purpose to be explained later. A rotatable portion 4 is mounted on a bearing 5 in the top 2, a stationary controller portion 6 is attached to the top 2 by means of rods 7 (only one of which is shown), a drawn cover 8 is connected to the top 2 by means of angle connectors 9 and a lead block of insulation 10 is disposed between the cover 8 and the top 2 at the rear of the controller.

The rotatable portion 4 of the controller is provided with an operating handle 11 to which it is connected by a shaft 12. The handle 11 has an extension 13 projecting therefrom to engage the lug 3 on the top 2

when the handle is in its off-position. A bracket 14, having arms 15, is mounted on the lower end of the shaft 12, and annular cams 16, 17 and 18 are mounted on the arms 15. The inner surface of the cam 16 has a cylindrically curved portion 19 and a similar portion 20 having a greater radius of curvature; the inner surface of the cam 18 has a cylindrically curved portion 21 and a similar portion 22 having a greater radius of curvature; and the inner surface of the cam 17 has a recess 23.

The stationary portion 6 of the controller embodies two disks 24 and 25 which are separated by a cylinder 26 of insulating material and are held together by a bolt 27 and a nut 28. The disk 24 is composed of insulating material and the disk 25 is composed of conducting material. The disk 25 has one side of the line connected thereto by means of a connector 25^a. Switches 29 and bell-crank levers 30 are mounted upon the disk 25 to co-act with the cams 16, 17 and 18 which control the operation of the switches 29. These switches 29 are circumferentially located around the bolt 27 and embody stationary and movable contact members. Each of the stationary contact members comprises a contact terminal 31, preferably composed of graphite, and a metal-piece 32 which connects the contact terminal 31 to a connector 33. Each of the movable contact members is electrically connected to the disk 25 and comprises a rod 34 having one end pivotally connected to one of the bell-crank levers 30 and having its other end connected to a clamp 35 which supports a contact terminal 36, preferably composed of graphite. Coil springs 37, surrounding the rods 34, are disposed between the clamps 35 and the disk 25 and tend to effect engagement of the contact terminals 36 and 31. Each of the bell-crank levers 30 has a roller 38 mounted on one end thereof and each is pivotally mounted upon a standard 39 which, in turn, is mounted upon the disk 25.

In illustrating my invention, a controller provided with three cams for controlling a number of switches has been shown, but such a structure is not essential to my invention, and, if so desired, one cam or a number of cams of various forms may be constructed to operate one or a number of switches.

In the controller shown, four switches

coöperate with the upper annular cam 16, four switches 41 coöperate with the middle annular cam 18 and one switch 42 coöperates with the annular cam 17. The cams 16, 17 and 18 are so mounted upon the arms 15 of the bracket 14 that the portions 19 and 21 of the cams 16 and 18 lie diametrically opposite each other and the recess 23 is disposed between portions 19 and 21.

10 In the initial or off-position of the controller, with the projection 13 on the controller handle 11 in contact with the lug 3, the roller 38 upon the switch 42 is disposed within the recess 23 of the annular cam 17 so that the coil spring 37 of the switch 42 may effect engagement between the contact terminals 36 and 31 thereof. In this position, the rollers 38 of the switches 40 and 41 rest upon the portions 19 and 21 of the cams 16 and 18 so that all switches 40 and 41 are held in open position. However, as the controller handle 11 is moved in a forward direction, as indicated by the arrows in Figs. 2, 3 and 4, the roller 38 of the switch 42 will be moved from the recess 23 to separate the contact terminals of the switch 42 and the rollers 38 of the switches 40 and 41 will pass in a certain sequence from the portions 19 and 21 of the cams 16 and 18 to the portions 20 and 22 and thus allow the springs 37 of these switches to effect engagement of their contact terminals 36 and 31. In returning the controller to its off-position, the switches 40 and 41 will be opened in the reverse sequence until the off-position is reached, when the switch 42 alone will be closed.

The controller top 2 is preferably rectangular in form and has a raised portion 2^a at the back thereof which may be utilized for attaching the controller to a supporting base. The cover 8 is preferably made cylindrical in form. It may be noted that this controller may be immersed in oil, if so desired, and that, when operated without oil, it may be mounted in any vertical, horizontal or inclined position.

Various modifications in the apparatus and improvements in the operation thereof may be effected without departing from the spirit and scope of my invention, and I desire, therefore, that only such limitations shall be imposed as are indicated in the appended claims.

I claim as my invention:

55 1. In a controller, the combination with a rotatable member having a plurality of interior cam surfaces lying in parallel planes, of a plurality of switches located outside of said planes, and levers disposed within said member, each of said levers being adapted to be governed by one of said cam surfaces to operate one of said switches.

2. In a controller, the combination with a plurality of annular cams mounted adjacent

one another, of a plurality of switches each having a stationary and a movable contact member, means for biasing said switches to closed positions, and a plurality of levers each pivoted to the movable member of one of said switches and pivotally mounted to be actuated by the interior surface of one of said cams.

3. In a controller, the combination with a rotatable shaft having three rings mounted thereon, said rings having inside cam surfaces, and a plurality of switches having stationary and movable contact members, of a plurality of pivotally mounted levers each having one end joined to one of said movable contact members and another end disposed adjacent to said cam surfaces, and means whereby said rings may be rotated to control the operation of said switches.

4. In a multi-position controller, the combination with a rotatable shaft, three annular cams mounted thereon, and a plurality of switches having stationary and movable contact members, of a plurality of pivotally mounted levers each having one end joined to one of said movable contact members and another end disposed adjacent to said cams, the configuration of the cam surfaces being such that one of said cams may close one of said switches in the off-position of said controller and two of said cams may operate the remaining switches in sequence.

5. In a controller, the combination with a rotatable shaft, a handle and a bracket mounted on said shaft, and a plurality of annular cams mounted adjacent one another on said bracket, of a stationary shaft aligned with said rotatable shaft, a plurality of switches circumferentially located as to said stationary shaft and having stationary and movable contact members, a plate mounted on said stationary shaft for supporting the stationary contact members of said switches, a second plate mounted on said stationary shaft for guiding the movements of said movable contact members, springs for biasing said switches to closed position, a plurality of levers pivotally mounted on said second plate and each having one end attached to one of said movable contact members and having another end disposed within said annular cams for governing the operation of said switches.

6. In a controller, the combination with a rotatable shaft, and a plurality of cams mounted on said shaft, of a stationary structure embodying a base and a guiding member, a plurality of switches each having movable contact members guided by said guiding member and having coöperating stationary contact members located upon said base, and a plurality of levers pivotally mounted on said guiding member and each having one end attached to one of said

movable contact members and having another end bearing upon said cams for governing the operation of said switches.

7. In a controller, the combination with
5 a rotatable shaft, of a plurality of cams supported thereby in different planes at right angles to said shaft, a plurality of circumferentially arranged switches located in another plane at a right angle to said shaft,
10 levers connected to said switches and adapted to be engaged by said cams to cause the closing of said switches, and a spring associated with each of said switches to open them upon the removal of said cams from
15 engagement with said levers.

8. In a controller, a pair of cams of similar contour but oppositely disposed and located side-by-side, and a pair of switch members each disposed for actuation by one
20 of said cams, whereby said switch members are adapted at times to be both open or both closed.

9. In a controller, three switch members, two of said switch members being symmetrically disposed relatively to said third switch member, a cam for each member, said
25 cams being rotatable together relatively to said switch members, two of said cams being of similar contour but oppositely disposed to cooperate with said symmetrically
30 disposed switch members to open and close said two switch members in a certain sequence, and said third cam being constructed to maintain said third switch member ini-

tially closed when said other switch mem- 35
bers are open and to maintain said third switch member open when said other switch members are closed.

10. In a controller, the combination with a rotatable cam, of a supporting member, a 40
bell-crank lever mounted thereon, one end of said lever being adapted to be engaged by said cam for operation thereby, a switch member pivoted to the other end of said lever, and means engaging said switch mem- 45
ber and said support for operating said switch member in opposition to the operative force of said cam.

11. In a controller, a frame having a lug, a shaft rotatably mounted therein and hav- 50
ing an extension for engaging said lug in one position thereof, a plurality of annular cams rotatable with said shaft, a plurality of switches each disposed to be actuated by one of said cams, and means for actuating 55
said switches in opposition to said cams, said cams being so constructed that one of said switches is closed and said other switches are open when said extension is in engagement with said lug and said one 60
switch is open and the other switches are closed in a certain sequence when said extension is not in engagement with said lug.

In testimony whereof, I have hereunto
subscribed my name this 27th day of Nov., 65
1915.

ORA A. COLBY.